

DOCKET NO: 240800US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
NORIHISA ARAI : EXAMINER: ROSE, K. L.
SERIAL NO: 10/670,529 :
FILED: SEPTEMBER 26, 2003 : GROUP ART UNIT: 2822
FOR: METHOD OF MANUFACTURING :
SEMICONDUCTOR DEVICE INCLUDING
PROCESS FOR IMPLANTING
IMPURITIES INTO SUBSTRATE VIA
MOS TRANSISTOR GATE ELECTRODE
AND GATE INSULATION FILM

REMARKS ACCOMPANYING
PRE-APPEAL BRIEF REQUEST FOR REVIEW

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Applicant respectfully requests that a Pre-Appeal Brief Conference be initiated in accordance with the pilot program outlined in the Official Gazette Notice of July 12, 2005.

FAILURE TO PRESENT A *PRIMA FACIE* CASE OF OBVIOUSNESS

Applicant submits that the Official Action of April 4, 2005 has failed to provide a *prima facie* case of obviousness with respect to any of Claims 18-32 under 35 U.S.C. §103.¹

Pending Claims 18-22 stand rejected under 35 U.S.C. §103 as unpatentable over Applicant's Prior Art in view of Tsai. As outlined in detail in the response filed July 5, 2005, this rejection is deficient in that neither reference provides any discussion relative to an entire element of the Applicants' claims.

¹ See Official Action of April 4, 2005 detailing the rejection of Claims 18-32 under 35 U.S.C. §103 based in part on Tsai et al. (U.S. Patent No. 6,245,639, hereinafter "Tsai").

Independent Claim 18 recites, *inter alia*, “the shallow trench isolation film and the gate oxide film are doped with boron.”

As discussed in detail in the response filed July 5, 2005, no where in Tsai is there a discussion relative to the above claim language. In response to this assertion, the Advisory Action provided the following explanation:

[T]he applicant argues that the Tsai reference does not disclose the gate oxide to be doped with boron. This is erroneous since the Tsai reference discloses that boron moves from the channel, gate oxide and gate structure and comprises boron. (Column 3, lines 26-28) Therefore the gate oxide comprises boron and therefore the rejection stands.²

As can be seen from the plain text of this cited portion of Tsai, the assertion made in the Advisory Action is clearly misguided.³ The cited portion of Tsai describes that (1) the channel region includes boron that may move to edge 7, and (2) the channel region is below gate insulator 2 and gate structure 3. In fact, the very next sentence states “Subsequent thermal cycles can include the formation of the gate insulator layer.” Accordingly, the thermal cycles referred to in column 3, lines 26-28 of Tsai may occur before the gate insulator 2 is formed (or the gate structure 3 formed above the gate insulator 2). Thus, column 3, lines 26-28 of Tsai do not state that boron may move from the gate insulator or gate structure to edge 7, as these elements may not even exist yet. In addition, column 3, lines 39-44 of Tsai state “Again, as was the case with edge 7, the interstitial silicon, at edge 8, will enhance the movement of, or allow boron to be depleted from the channel region, to edge 8.” This sentence clearly shows that the only location of boron contemplated by Tsai is in the channel region, as the gate insulator 2 and gate structure 3 are not mentioned at all.

Further, the method of making the device described by Tsai clearly states that boron is implanted in the channel region before the gate insulator or gate structure is even formed.

²See Advisory Action of August 9, 2005, paragraph 11.

³Column 3, lines 26-28 of Tsai state, “The interstitial silicon will allow movement of boron to occur from the channel region, underlying gate insulator 2, and gate structure 3, to edge 7, during the subsequent thermal cycles.”

Column 4, lines 27-31, 37-40 and 42-43 of Tsai state that "First, silicon oxide layer 16 ... is used to completely fill shallow trench shape 13." Then, "A threshold adjust ion implantation procedure ... such as boron or BF₂ ... is next performed," and (after this procedure) that "A silicon dioxide gate insulator layer 2, is thermally grown." As gate insulator layer 2 is formed *after* the boron implantation into the channel region, the gate insulation later 2 described by Tsai would not have boron doped therein. Accordingly, gate structure 3 formed on gate insulator 2 would not include boron either.

Accordingly, Tsai does not teach or suggest "the shallow trench isolation film and the gate oxide film are doped with boron," as recited in Claim 18. As it is well settled that all claim limitations must be taught or suggested by the cited art (See *In re Royka*, 180 USPQ 580 (C.C.P.A. 1974)), a *prima facie* case of obviousness has not been established for Claim 18.

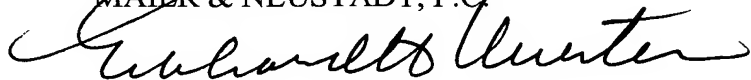
The outstanding rejections of independent Claims 19 and 24 rely on Tsai as describing that a shallow trench isolation film doped with boron.⁴ As Tsai does not disclose *any* impurities doped in a shallow trench isolation film, a *prima facie* case of obviousness has not been established for independent Claims 19 or 24 either.

CONCLUSION

Based on this clear legal deficiency in the above-noted rejection, Applicants respectfully request that prosecution be re-opened.

Respectfully submitted,

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⁴See Office Action dated April 4, 2005, page 3, lines 6-9 and page 5, lines 1-4.